Timely Detection of Late -Onset Hearing Loss in Taiwan: Risk Factor Follow-up

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Helping Children with Hearing Loss Learn to Listen and Speak

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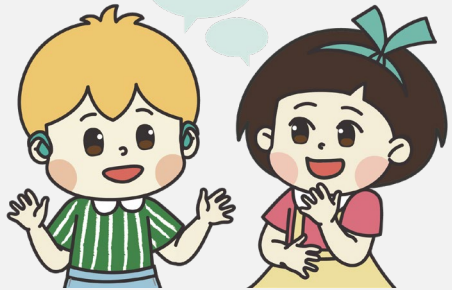
Leave your comments / questions and contact info



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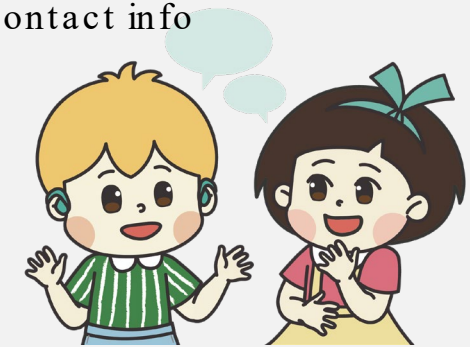

Background ：In Taiwan

UNHS since 2012

2022: 98.7% screening rate

Preschool Hearing Screening

2021:

59.3% screening rate

10.3% referral rate

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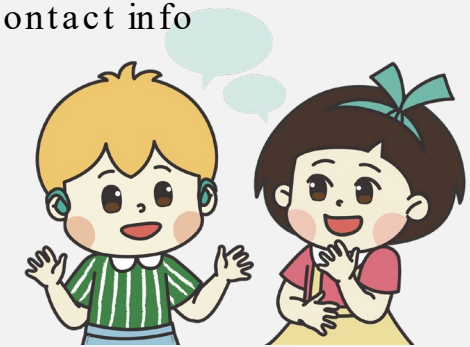

Late-onset Hearing Loss

Definition

- Diagnosed after **3 months** of age in children who have passed UNHS

Prevalence

- 7.5 in 10,000 children who passed UNHS
- Accounts for 22% of children with bilateral HL

Challenges

- Parental difficulty in detection
- A pass in UNHS may foster the misconception that a child's hearing will always be normal

Lu et al. (2011). Weichbold et al. (2006)

Aspects of Impact Due to Late-onset Hearing Loss in Children

- Ability to perceive sounds, words, and language rules
- Speech and language development
- Communication skills
- Cognitive development
- Social-emotional development
- Academic performance

(Eubanks & Abbott, 2023; Ireland Assignment Help, n.d.; Wrington State Department of Health, n.d.)

Timely intervention is the key

to reducing the impact of late-onset hearing loss

Language performance

Late-onset HL = N.S. Early-onset HL

When intervention was provided, on average, 1 month after identification for both groups

Jeong et al. (2016). *European Archives of Oto-Rhino-Laryngology*, *273*, 879-887.

Risk Factor Monitoring:

A Pivotal Approach to Timely Detection

- Regular monitoring of children who pass UNHS but exhibit risk factors for HL enables timely and effective detection of potential late-onset HL (Weichbold et al., 2006).

image: Flaticon.com

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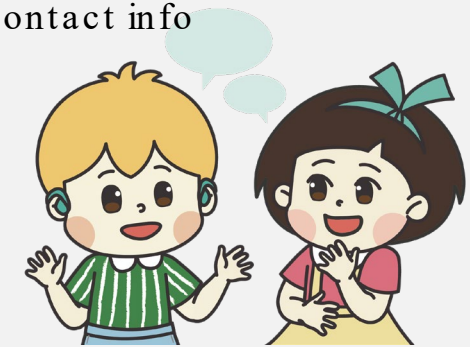


Risk Factors (1/2)

- **Perinatal factors**
  - Birth weight < 1500g
  - Apgar score 0-4 at 1min, 0-6 at 5min
  - NICU > 5 days
  - In utero infections: CMV, herpes, rubella, syphilis, toxoplasmosis
- **Medical treatments**
  - ECMO, assisted or mechanical ventilation, hyperbilirubinemia that requires exchange transfusion
  - Exposure to ototoxic medications (e.g., gentamicin, tobramycin) or loop diuretics (e.g., furosemide/Lasix)
  - Chemotherapy
- **Infections**
  - Culture-positive postnatal infections: bacterial and viral meningitis (especially herpes viruses and varicella)
  - Recurrent or persistent otitis media with effusion > 3 months

(Dumanch et al., 2017; J CIH, 1990, 2000, 2007, 2019)

Risk Factors (2/2)

- **Family history & concerns**
  - Family history of permanent childhood hearing loss
  - Caregiver concern regarding hearing, speech, language, or developmental delay
- **Disorders**
  - Syndromes associated with hearing loss: neurofibromatosis type II, osteopetrosis, Usher, Waardenburg, Treacher Collins, Alport, Pendred, Jervell and Lange Nielson
  - Neurodegenerative disorders: Hunter syndrome, Friedreich ataxia, Charcot-Marie-Tooth syndrome
- **Craniofacial anomalies**
  - Anomalies including cleft lip / palate, microtia, aural atresia, choanal atresia, ear tags, ear pits, and temporal bone anomalies
  - Physical findings associated with syndromes known to include hearing loss (e.g., white forelock)
- **Head trauma**
  - especially basal skull/temporal bone fracture that requires hospitalization

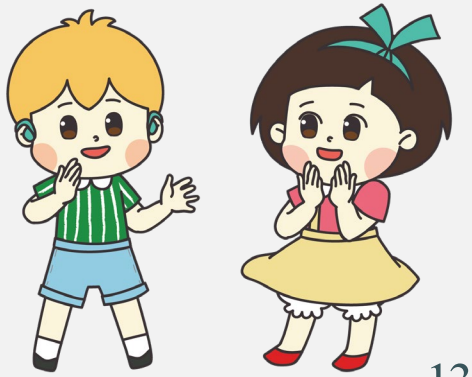
(Dumanch et al., 2017; J CIH, 1990, 2000, 2007, 2019)

Risk factor investigation for children in Children's Hearing Foundation (CHF)

645 cases
2020 - 2023 → 115 cases (17.8%) passed UNHS → 4: early-onset
8: no record of age at diagonosis → 103 cases (16.0%) Late-onset HL

Medical history review → Analysis of risk factors → Descriptive statistics

may have had congenital HL undetected by UNHS



Demographics (*N*=103)

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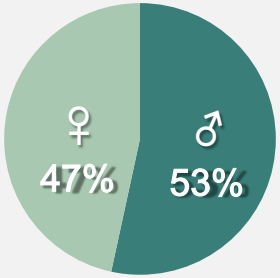
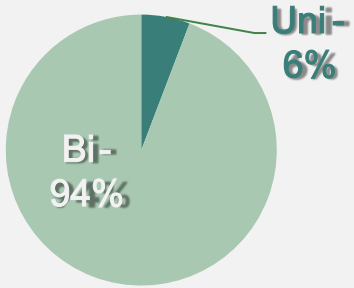
Sex



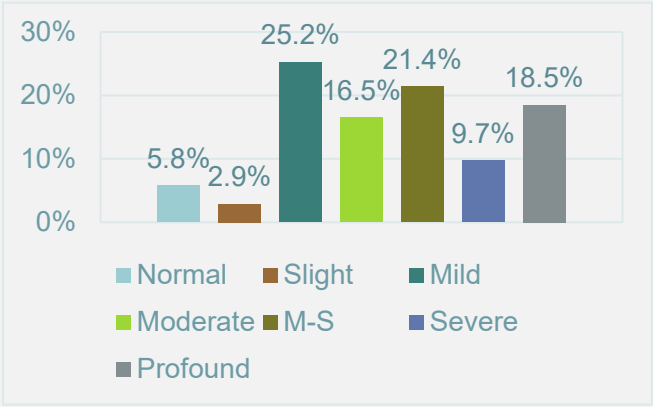
Age at diagnosis (mo.)

Mean: 39
SD= 26
Range: 4-127

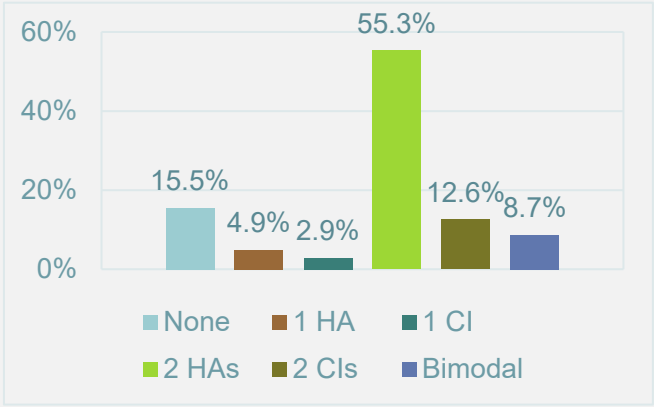
Uni- vs. Bi-lateral HL



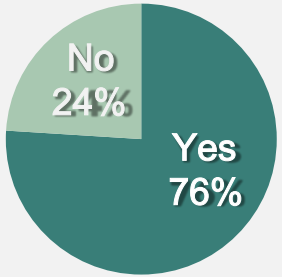
Degree of HL (better ear)



Technology



Intervention enrollment



Risk factors exhibited in CHF's children (1/2)

- **Perinatal factors**
  - Birth weight < 1500g
  - Apgar score 0-4 at 1min, 0-6 at 5min
  - NICU > 5 days
  - In utero infections: CMV, herpes, rubella, syphilis, toxoplasmosis
- **Medical treatments**
  - ECMO, assisted or mechanical ventilation, hyperbilirubinemia that requires exchange transfusion
  - Exposure to ototoxic medications (e.g., gentamicin, tobramycin) or loop diuretics (e.g., furosemide/Lasix)
  - Chemotherapy
- **Infections**
  - Culture-positive postnatal infections: bacterial and viral meningitis (especially herpes viruses and varicella)
  - Recurrent or persistent otitis media with effusion > 3 months

Gestational diabetes / pre-eclampsia

(Dumanch et al., 2017; J CIH, 1990, 2000, 2007, 2019; Baylan et al., 2010)

Risk factors (2/2) exhibited in CHF's children (2/2)

- **Family history & concerns**
  - Family history of permanent childhood hearing loss
  - Caregiver concern regarding hearing, speech, language, or developmental delay
- **Disorders**
  - Syndromes associated with hearing loss: neurofibromatosis type II, osteopetrosis, Usher, Waardenburg, Treacher Collins, Alport, Pendred, Jervell and Lange Nielson
  - Neurodegenerative disorders: Hunte… a… Tooth syndrome
- **Craniofacial anomalies**
  - Anomalies including cleft lip / palate, microtia, aural atresia, choanal atresia, ear tags, ear pits, and temporal bone anomalies
  - Physical findings associated with syndromes known to include hearing loss (e.g., white forelock)
- **Head trauma**
  - especially basal skull/temporal bone fracture that requires hospitalization

Identified HL related gene(s)

Branchio-Oto-Renal (BOR) Syndrome

Large vestibular aqueduct syndrome (LVAS) Syndrome

(Dumanch et al., 2017; J CIH, 1990, 2000, 2007, 2019)

Take a guess!!

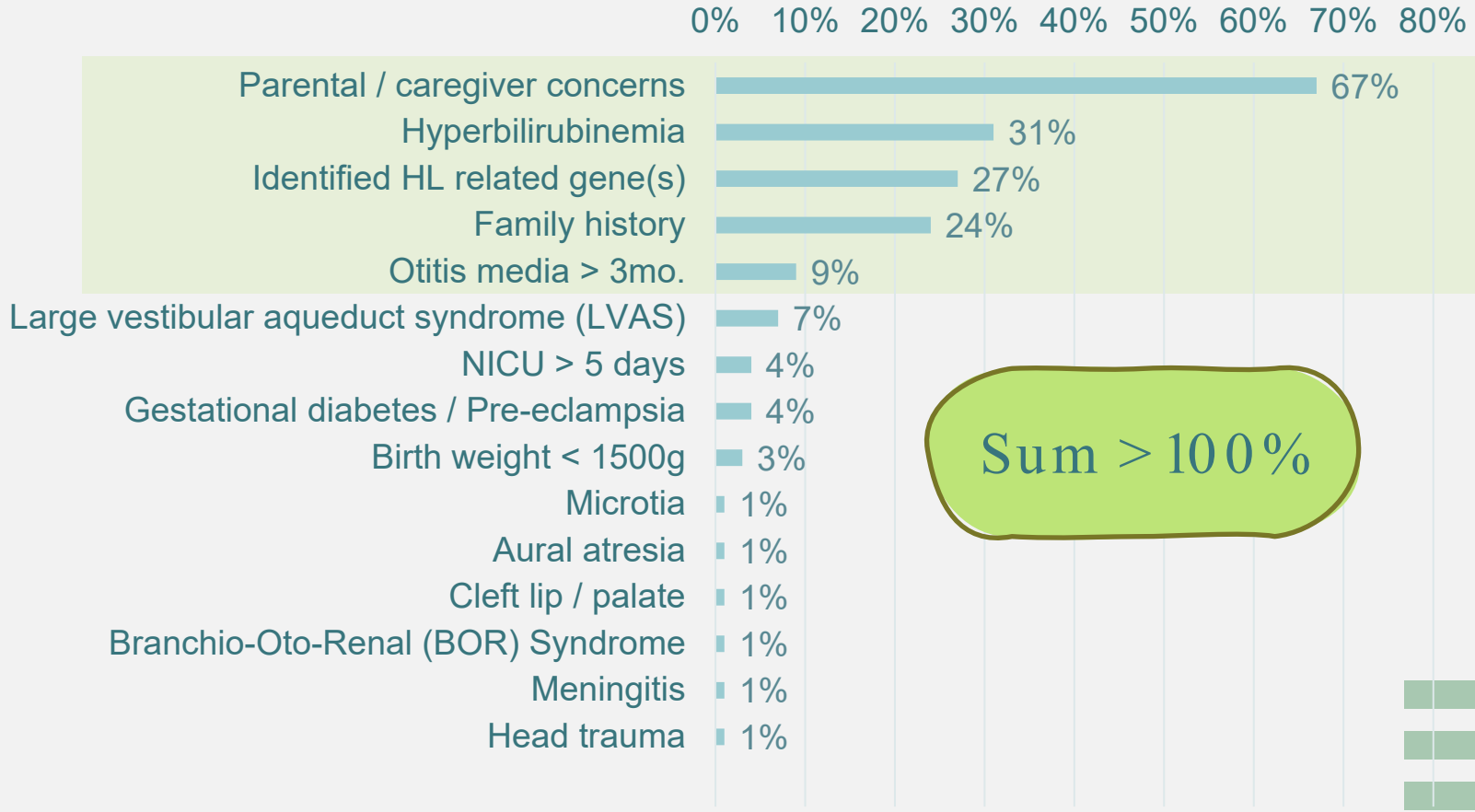
What were the 5 most prevalent risk factors among the 103 children with late-onset hearing loss in the CHF study?

Join at

slido.com

#3907 304

The proportion of risk factors present (N=103)



True examples of caregiver concern regarding hearing, speech, language, or developmental delay

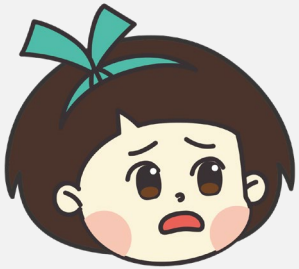
At age 2, he remains non-verbal, sporadically producing meaningless sounds, and rarely vocalizing.

When she was younger, she responded well to calls, but later showed no response to calls from behind.

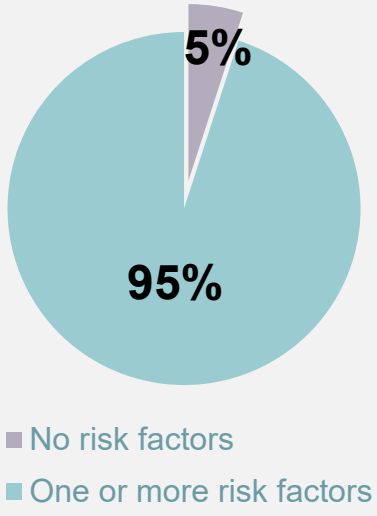
Currently, she only produces the sounds 'ma1' and 'ma4,' and has not yet produced 'ba4.'

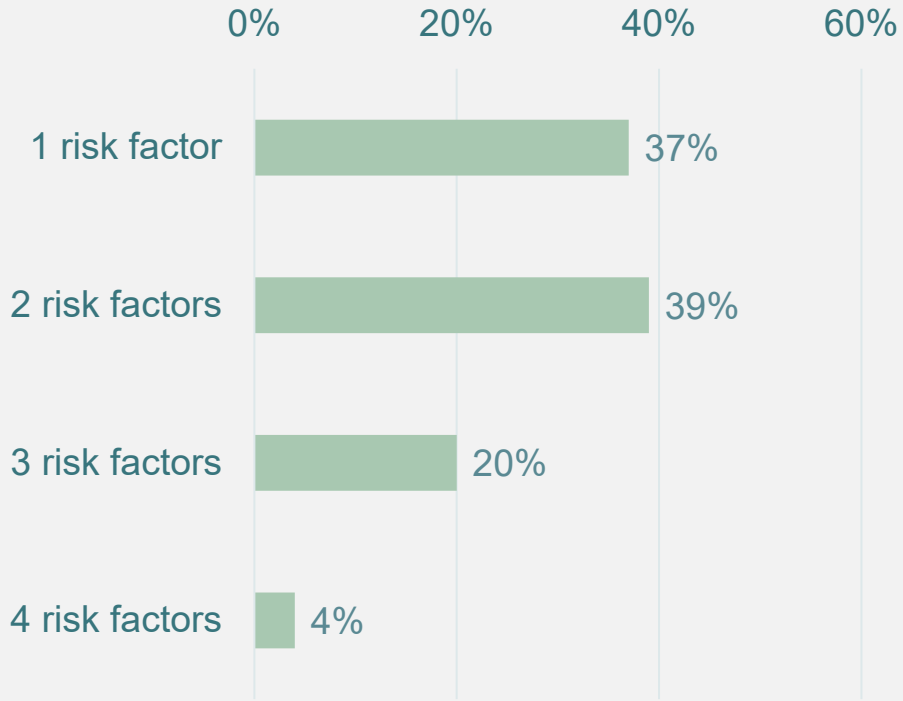
Unable to form complete sentences, mostly using single words.

Displays poor response to sounds; slowly turns head to loud noises or rarely shows startle response even when being called loudly.

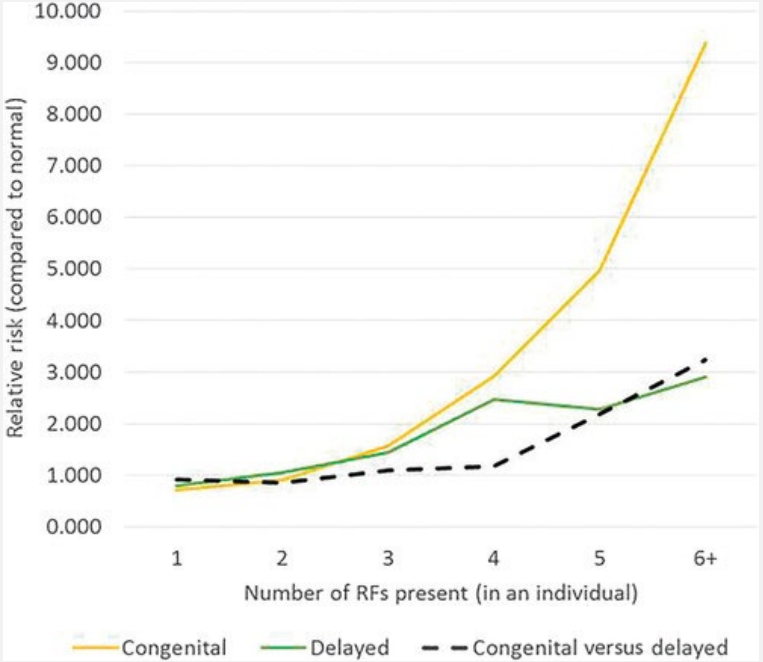


The occurrence of risk factors is **variable and complex**





The greater the number of risk factors exhibited, the higher the likelihood of both congenital and late-onset hearing loss



(Dumanchet al., 2017)

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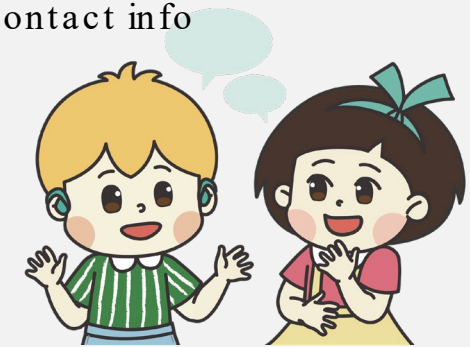

Follow-up Timeline

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Babies who passed UNHS

No risk factors

Ongoing surveillance of communicative development

Certain risk factors

- Caregiver concern
- Family history
- NICU > 5 days
- ECMO
- CMV
- Syndromes associated with HL
- Neurodegenerative disorders
- Meningitis
- Head trauma

Hearing evaluation by 6 months of age

Other risk factors

- Low birth weight
- Hyperbilirubinemia
- Ototoxic medications
- Congenital herpes, rubella, syphilis, toxoplasmosis
- Craniofacial anomalies
- Recurring or persistent otitis media with effusion > 3 mo.
- Others

Audiologic follow-up at 24-30 months of age

(Dumanch et al., 2017; J CIH, 1990, 2000, 2007, 2019)

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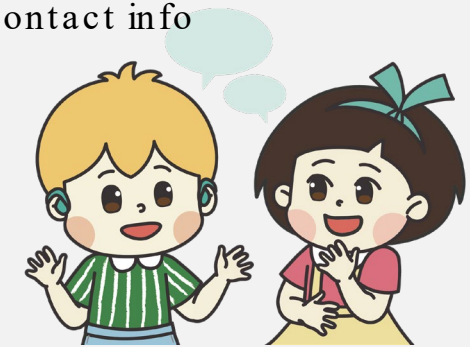

Supporting children with late -onest hearing loss

Risk factor follow-up

- Analysis based on CHF's database
- Analysis based on Taiwan Universal Health Insurance Database
- Public awareness promotion

Hearing performance checklist

- For children between ages of 3 and 6
- Parents and/or preschool/kindergarten teachers
- Under development

Preschool hearing screening

- Public health nurse training for preschool hearing screening
- Advocacy for local government implementation of preschool hearing screening

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HeAL 2024 Hearing Across the Lifespan
June 6-8, 2024
Cernobbio, Lake Como, Italy
www.heal2024.org

2024 AG BELL GLOBAL LISTENING AND SPOKEN LANGUAGE VIRTUAL SYMPOSIUM
JUNE 26-27, 2024

Take home messages

- Reviewing and documenting the presence of **risk factors** for hearing loss is crucial in identifying the potential late-onset HL.
- As per J CIH guidelines, children who pass UNHS but present risk factors for hearing loss should undergo hearing evaluation by **6 months of age**, or **between 24 and 30 months of age**, depending on the specific risk factors.
- Even with negative results of UNHS, hearing and speech professionals must NOT overlook **caregiver concerns** regarding their child's hearing, speech, and language development.
- It is important NOT to disregard the possibility of hearing loss even in children **without identified risk factors**.

Acknowlegements

Coauthors

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THANK YOU

Any questions?

Contact: yipingchang@chfn.org.tw

Leave your comments / questions and contact info

Scan QR code for CHF's official website

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